Solenodon also confirm my determination of the homologies in *Centetes**.

In conclusion I give the following synoptic view of the constitution of the superior molar teeth in various genera of the Bunotheria.

Cusps present.					
External, intermediate, two internal.	External, no intermediate, two internal.	External, intermediate, one internal.	External, no intermediate, one internal.	No external, no intermediate, two internal.	No external no intermediate, one internal
Adapidæ.	Gymnura.	Mystomyidæ.	Mesonyx.	Chrysochloris (2nd internal rudimentary).	Centetes.
Tupæidæ.	Erinaceus.	Mioclænus.	Leptictis.		
Galeopithecidæ.	Macroscelididæ.	Miacis.	Stypolophus.		
Soricidæ.		Talpidæ.	Oxyæna.	Solenodon (ditto).	
Urotrichus.		(Didelphys.) (Canis.)	Chriacus. Deltatherium. Esthonyx. (2nd internal rudimentary).		

III.—*On the Microscopic Structure of thin Slices of Fossil Calcispongiæ.* By H. J. Carter, F.R.S. &c.

In the "P.S." which I hastily added to my last "Observations on the so-called 'Farringdon Sponges' (Calcispongiæ, Zittel)," it is stated that Dr. Harvey B. Holl had kindly sent me four slides, testifying respectively to two facts, viz. 1st, that the spiculation of *Verticillites anastomans* was that of a Calcisponge, to me "precisely like and almost identical in size" with that of *Grantia compressa*; and 2nd, that it was confronted by a crust of pinlike spicules with their heads outwards; and at the conclusion, that I had *not* seen the latter in *my* specimens of *Verticillites anastomans* from Farringdon in Berkshire.

Wishing to confirm this, I obtained through Dr. Holl's kindness his entire specimen, and having made two or three

* This view was first advanced by the writer in the Annual Report U.S. Geol. Surv. Terrs. 1873-74, p. 472.

slides from it, found in all what I have stated; while, seeing that the specimen was identical with one of my own from Farringdon, I did the same with this with the same result; but when thus engaged I saw that I had specimens of *another* form in my collection, and that this also presented the pinlike spicules. It was then evident that there were *two*, viz. Dr. Holl's and another, and that they chiefly differed in the form of the siphonal cloaca which passes through the centre of each septum, like that of an *Orthoceras*, only with the convexity of the septa reversed (that is, directed upwards or outwards) in *Verticillites*. In Dr. Holl's specimen this passage is reduced to a marginated circular hole of intercommunication in the septa which separate the chambers; while in the other form it is a continuous tube or cylinder communicating with the chambers respectively by holes in its *sides*, which thus, through this canal, establish a communication with the exterior.

On reference to Dr. Gustav Steinmann's figures ("Pharetronen-Studien," Neues Jahrbuch f. Mineral. Geol. u. Paläontologie, 1882, ii. Bd. Taf. vi. u. viii. figs. 5, 6 u. 1 respectively) I see that Dr. Holl's species has been called "*helvetica*" by De Loriol (Urgonien inférr. de Landeron, p. 65, t. v. figs. 4–11); while the other form had long since received the name of "*Verticillipora* (*Verticillites*, Defr.) *anastomans*" from Mantell ('Wonders of Geology,' p. 636, fig. 3, &c.).

The pinlike spicules, however, are present in *both*, and arranged in the manner of a funnel, with the spout inwards or continuous with each external aperture of the radial canals, as may be proved by making a horizontal and vertical section of the wall respectively, when the full length of the pinlike spicules is seen in the former sloping inwards towards the canal, and their truncated ends in a circle surrounded by the triradiates in the latter, while by making one horizontally through the septum and the wall *together* both may be seen at once. The pin spicules, like the triradiates, are dissolved by diluted nitric acid, although generally preserved in form when that of the triradiates has almost entirely disappeared. It is very probable that Dr. Holl's specimen came from the same neighbourhood as my own; but, be this as it may, it would be desirable to ascertain if the pinlike spicules are absent in the species from the Jura and elsewhere out of England, as they are in Dr. Hinde's *Verticillites D'Orbignyi*, which came from the Upper Greensand at Warminster in Wiltshire, within twenty-four miles of Farringdon.

The next point to which I would direct attention is the change which takes place in the spiculation of the Calcispongiæ during fossilization, to which I have also hastily alluded

in the following "footnote" to my above-mentioned paper in the 'Annals,' viz.:—

"Can it be possible after all, that this concentric lamination is mineral and not organic—that is, that the calcareous layers are but a reproduction in *form* of the original spicules, which, during fossilization, have become dissolved and furnished this solution for the new structure, as often seen in the chalcedonization of the vitreous sponges, or as agatoid layers round a grain of extraneous matter? The examination of another slice of my specimen of *Sestrostomella* from the Jura strongly inclines me to this view" ('Annals,' ser. 5, vol. xi. p. 35).

Thus influenced, I lost no time in endeavouring to confirm the inference by grinding down slices of several species of fossil Calcispongiæ to a minimum of at least 1-500th of an inch, or semitransparency, viz. *Verticillites anastomans* and *helvetica*, *Peronella dumosa*, *Oculospongia dilatata*, *Elasmostoma acutimargo*, and two or three others, when I came to the following conclusions:—

1. That during fossilization, the organic matter of the spicule disappearing, the mineral matter, thus deprived of its cement, is set free.

2. That while this is taking place the forms of the spicules are more or less destroyed and the mineral matter more or less passes into solution.

3. That the forms of the spicules thus more or less destroyed run into each other so as to assume shapes totally different from what they were originally, while the rest of the calcareous material in a state of solution becomes deposited in the form of fibre composed of one or more concentric layers enclosing the lines of spicules.

4. That although the slice when reduced to extreme thinness may present no distinct tri- or quadriradiates, yet one or more *perfect* ones may have come into view during the latter part of the reduction, when, after every two or three strokes of the grinding, the slice should be transferred to the field of the microscope, lest the spicule be rubbed off altogether. Hence the advantage of grinding down the slice one's self, otherwise such important facts might pass unnoticed.

5. That if the tri- or quadriradiate of a Calcisponge *cæt. par.* is thus seen, this should be sufficient to prove the nature of the fossil, although the next stroke of the grinding may destroy it, which is often the case.

Observations.

It is, however, the running together of the lines of the

original tri- or quadriradiate spicules which leads, in all instances that I have examined, to the branched, forked, and other forms that resemble the spiculation of a Lithistid sponge, especially after the slice has been reduced to the lowest degree (that is, to semitransparency). Hence, whenever I have been so fortunate as to see even one undoubted tri- or quadriradiate of a Calcisponge, although, as before stated, it may have disappeared in the subsequent grinding, I have felt as convinced that the fossil was a Calcisponge as that the fantastic forms which accompanied it were spurious; so that now when I come to a perfect tri- or quadriradiate of the kind mentioned, I stop grinding and mount the specimen for preservation and more deliberate examination.

Process of Grinding down a Slice of a Calcareous Fossil for Microscopical Examination.

Take about one part of half-dry Canada balsam, and place it on the centre of a glass slide; heat it until melted over a spirit-lamp with about half an inch vertical flame, moving the slide backwards and forwards to prevent the latter from cracking; add two parts of shellac; and when the whole has bubbled up, stir it with the point of a needle so as to mix well, and spread it altogether over a little more of the glass than the size of the slice to be reduced.

Previous to this, cut off with a watch-spring or very fine saw fixed in an iron bow-frame (all of which may be obtained from an ironmonger at a very small charge) the slice to be ground down; and if there be much siliceous matter in the fossil, the saw (which is very cheap) may be sacrificed by the addition of emery powder and water to the groove, as this accelerates the cutting. (Of course where a machine with horizontal turning-wheel is possessed, such as is used for cutting siliceous fossils, flint, &c., this is the quickest and most economical way to obtain the "slice.")

Having thus obtained it, so far prepared, rub one side (viz. that to be examined) down to *scratchless smoothness* on a schoolboy's slate or very fine honestone with level surface, to effect which it is absolutely necessary that all the materials should be entirely freed by washing from every particle of emery or siliceous mineral that may happen to be present; otherwise the calcareous surface will become almost irremediably furrowed.

Next dry the slice on a tin or paper tray placed inside the fender by the fire, where it can remain until the next part of the process is completed.

Now remelt the material on the glass slide as before; and when sufficiently fluidified to present a uniformly level surface (but *not burnt*, for this would destroy the tenacity of the cement and thus give it a crispness which, by cracking, would defeat all attempts at further reduction), quickly transfer the warmed slice (which should now be close at hand) to it, while with a little pressure the "*smoothed*" surface is brought into direct contact with that of the glass. Thus let it remain on the table where this is done until the glass feels cold to the touch.

After this reduce the slice to the thinness of a wafer over a very fine vertical rotating grinding-stone, or on a copper plate with emery powder and water, horizontally.

Now wash it well in water, and, placing the slide on a piece of buckskin leather spread on the table or over a level surface (to keep it from slipping) with the slice uppermost, continue the reduction in water with a piece of very fine siliceous limestone, that may be obtained from a statuary, of a convenient form (that is, one which will admit of the surface of the slice coming into direct and continuous contact with that of the limestone), with which it should be horizontally rubbed until reduced to the required thinness, which must be ascertained by repeatedly transferring the slice to the field of the microscope with an inch object-glass and high ocular. The nearer this thinness is approached the oftener this transfer should be made, washing the slice by dipping the slide into a bowl of water each time that it is examined.

When sufficiently reduced, wash the slide as before, and stand it up to drain until the slice is perfectly dry. Then cover with benzol, followed by balsam and thin glass, for preservation and more deliberate examination.

I make no apology for introducing these remarks, as the "process," although open to criticism and improvement no doubt, answers the purpose; and while inexperienced I myself should have been very glad of such aid. Dr. Holl suggested to me the use of shellac, which is the most valuable hint that I have received.

IV.—*On the Presence of Starch-granules in the Ovum of the Marine Sponges, and on the Ovigerous Layer of* Suberites domuncula, *Nardo.* By H. J. Carter, F.R.S. &c.

It was but a short time since that I pointed out another instance of a structure like that of the cellular tissue of plants,